



## Mucogingival Considerations around Teeth and Implants

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### Introduction

Teeth and dental implants are surrounded by oral epithelium. This epithelium may be keratinized gingiva or mucosa. Multiple studies have demonstrated that the tissue type at this soft-tissue interface can have a profound impact on the health and long-term prognosis of both teeth and implants. (1) Areas of adequate keratinized gingiva are more resistant to chronic inflammation, less likely to have recession and more comfortable to cleanse. (2) Oral mucosa poorly adapts around dental implants and provides a poor seal, especially in areas with frenal attachments, when compared to keratinized gingiva. Also, the light pink color typically associated with keratinized gingiva produces a more aesthetic result in areas of high visibility. Areas which lack adequate keratinized tissue are said to have a mucogingival defect and are annotated via an asterisk in the Periodontal Screening and Recording (PSR) index. Once identified, the patient can then be referred to a periodontist for evaluation and potential correction of the defect.

The purpose of this clinical update is to outline surgical considerations and available materials and techniques to manage mucogingival defects around teeth and dental implants.

### Corrective Surgical Techniques

Surgical techniques to correct mucogingival defects center on two facets: graft type and flap management. The available grafts include autogenous grafts, which are harvested from the same individual receiving the graft, and allografts, which are harvested from another human being. Gingival flap management involves split or full thickness depending on whether or not the periosteum is included in the flap and the ultimate position of the flap. Surgeons will employ these two facets in any combination to achieve the reestablishment of esthetic, keratinized tissue and correct mucogingival defects around the teeth or dental implants.

### Types of Grafts

#### Free Gingival Autografts

Perhaps the oldest graft used to correct mucogingival defects is the free gingival graft. Known for its technical ease and predictable outcomes, variations of this technique have been reported in the literature as far back as the early 19<sup>th</sup> century. (3) The graft is harvested from the palate and should be between .75-1.75mm thick. This provides a sample that is composed of both connective tissue and epithelium. It is then transplanted onto a bleeding bed of connective tissue or directly upon denuded bone (4). Immobility of the graft is required for at least 10-14 days for the new blood vessels to grow into the graft and for it to become fibrously bound to the donor site. (5) These grafts achieve

complete integration at one month but continue to remodel and mature for up to one year. (6) Once healed, the grafts can be surgically repositioned coronally or laterally as part of an advanced flap to place the thick band of newly formed keratinized tissue where it is needed, either on an exposed root surface or around a dental implant.

The free gingival graft reliably produces thick, robust keratinized tissue and are ideal to augment areas of thin, non-keratinized mucosa. Drawbacks of this technique include size limitation (the graft is limited by the donor area) and the open wound created at the donor site on the patient's palate. Acrylic stents or periodontal dressings are routinely used to cover and protect this wound; however, patients can still experience pain and discomfort. In addition, the color and texture of the graft may differ from the surrounding mucosa at the recipient site. This potential "tire patch" effect limits the esthetic results attainable with this technique.

#### Connective Tissue Autografts

The use of connective tissue autografts (CTG) to increase the width of keratinized tissue around teeth or implants is based on the concept that the connective tissue will determine the morphology of the overlying epithelium. Connective tissue harvested from under a keratinized source such as the palate or maxillary tuberosity will result in the formation of keratinized tissue at the recipient site, even if this is in the middle of a bed of mucosa. (7) CTG can, like free gingival grafts, reliably and predictably produce keratinized gingiva. However, unlike free gingival grafts, the connective tissue graft does not include the overlying epithelium, which means that the wound at the harvest site can be completely closed and result in faster healing and less pain for the patient. Also, only 30% or less of the connective tissue graft is left exposed at the recipient site, with the remainder placed underneath a periodontal flap to provide blood and encourage faster angiogenesis into the graft. (8) In contrast to free gingival grafts, connective tissue grafts blend imperceptively with the neighboring tissue, resulting in the highest level of esthetics, which makes this the graft of choice for anterior maxillary grafting procedures.

The greatest limitations of the connective tissue graft are the limited quantity of graft by the donor site and the requirement for a second surgical procedure to harvest the graft.

#### Acellular Dermal Matrix Allografts

Acellular Dermal Matrix (ADM) is donated human dermis that has been processed to eliminate all cells, bacteria, viruses or any other potentially infectious agents leaving only the collagen substructure or matrix of the dermis. (9)

These grafts heal by invasion of the collagen matrix by host fibroblasts from the surrounding tissue in the recipient site. The principal advantage of using ADM over an autograft is the avoidance of a second surgical site to harvest the graft and thus the decreased risk for complications such as bleeding, neuropathy, pain or infection. Also, with the use of ADM, there is virtually no limit to the amount of graft that is available, which allows more teeth or implants to be grafted in one surgery which, ultimately, can lead to fewer total surgical procedures.

Currently there is no consensus as to whether or not ADM is as effective as connective tissue or free gingival autografts in obtaining root coverage or increasing the width of keratinized tissue. Some studies have shown this material has proven clinically and histologically to produce results similar to CTG with respect to root coverage, increased gingival thickness, gain in clinical attachment and decrease in probing depths. (10,11) However, other studies have shown ADM allografts are not as predictable as CTG at increasing the width of keratinized tissues or maintaining long-term root coverage. (12) It appears that ADM might be a good alternative to soft tissue autografts in the correction of mucogingival defects or deficiencies, but more research is needed.

### Gingival Flap Management

Mucogingival flaps serve two purposes. First, they can be repositioned either laterally or coronally to augment a mucogingival defect by themselves. Also, they can be used to provide a blood supply to the graft. The latter is especially important for grafts that are placed directly over a root surface or implant because the flap serves as the only source of blood for these grafts. Flap management is based upon the concept that a flap will survive so long as its blood supply is not overly compromised. Building on this concept, a flap can also be utilized to provide a blood supply to a graft. There are two basic types of flaps: full thickness, which include periosteum in the flap, and split thickness, which contain only epithelium and connective tissue and do not include the underlying periosteum. Full thickness flaps offer the advantage of being easier to reflect, manipulate and contain the greatest blood supply but can only offer the graft one source of blood because the remaining bone surface is denuded of blood vessels. However, the split thickness flap has less blood within the flap but offers the advantage of providing a bilaminar source of blood to the graft--from the flap and from the underlying periosteum.

Once a flap is elevated, it can be returned to its original position or it can be moved to a new position, either coronally or laterally. This is known as a pedicle flap. Pedicle flaps offer the surgeon the ability to move a blood supply to an area that is devoid of blood such as a tooth root or an implant surface. Thus, pedicle flaps are often used by themselves or combined with CTG or ADM grafts to cor-

rect mucogingival defects or increase the amount of keratinized tissue.

### Conclusion

The type of soft tissue surrounding teeth and dental implants can have a significant impact on their overall health and esthetics. A lack of keratinized gingiva might result in a chronic inflammatory condition which can be manifested by bleeding, erythema, recession and pain. These types of mucogingival defects can be identified by the general dentist using the asterisk in the PSR during a routine dental examination and referred to the periodontist. Predictable correction of this problem is available through a variety of surgical procedures which are based upon the utilization of grafts and pedicle flaps.

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